TOY BALL APPARATUS

CROSS-REFERENCES TO RELATED APPLICATIONS

This application is a continuation of and claims priority under 35 U.S.C. § 120 to U.S. Patent Application Serial Number 10/183,925, entitled "Toy Ball Apparatus," which was filed on June 25, 2002, by inventor David Silverglate, which in turn claims priority under 35 U.S.C. § 119 to U.S. Provisional Application Serial No. 60/308,502, entitled "Amusement Device With Mesh Structure," which was filed on July 27, 2001, by inventor David Silverglate. The entire disclosure of each of these applications is hereby incorporated by reference.

Background

Balls are one of the oldest types of toys and sports equipment. Many popular games involve rolling, passing, kicking, tossing, catching, bouncing, or hitting balls. For children who are just developing motor control, for those who may have some motor control dysfunction, as well as for many who simply enjoy such activities, it is often difficult and/or frustrating to handle various available throwing and catching devices, such as balls. One of the problems with many conventional balls is that they are sometimes painful to catch and/or hold. Another problem is that conventional balls do not offer a surface configuration that promotes quick, sure gripping, making them difficult to catch and/or hold.

Prior devices intended to address at least some of these concerns, such as the "GrabBall", commercially available from Sportime of Atlanta, Georgia, and the geodesic ball shown in U.S. Patent No. 3,889,950, suffer from drawbacks such as angular holes

with sharp corners and discontinuities and/or couplers where two hemispheres (or halves) are joined to form the respective balls. These aspects result in those apparatus being difficult to grasp and/or to catch when thrown, as well as being aesthetically unpleasing and non-resilient. A further drawback of such apparatus is that the holes of these balls are not appropriately sized to receive the fingers of a person using such balls.

Another prior device is the "Hol-ee Roller" dog chew toy commercially available from JW Pet Company, Inc. of Hasbrock Heights, New Jersey. This chew toy suffers from drawbacks similar to those discussed above, as it includes angular holes with sharp, uncomfortable edges resulting from discontinuities where inner and outer mold halves meet due to mold clearances and undercuts. Additionally, this chew toy is molded in one piece, and, therefore, can have only one color, which makes it aesthetically unpleasing. Furthermore, this device does not bounce well and has a relatively poor strength to weight ratio. This poor strength to weight ratio is due, at least in part, to the fact that stress on the structure of this device is not well distributed due to the angular holes requiring the device to be relatively thick in order to tearing at the hub-to-strut joints. Based on the foregoing, alternative toy ball structures that overcome at least some of the current drawbacks may be desirable.

Summary

Toy apparatus are provided, where the apparatus include a mesh having a plurality of loop structures with cooperative mating surfaces located around the perimeter of the loop structures. The loop structures form a surface of the apparatus when the cooperative mating surfaces are coupled with each other.

Brief Description of the Drawings

Figure 1 is an isometric view of a ball according to an embodiment of the invention, wherein the backside, bottom left of the ball is a substantial mirror image of the front side, top right;

Figure 2 is an exploded, perspective view of an approximate hemisphere of the ball illustrated in Fig. 1, showing various sub-components;

Figure 3 is a more detailed isometric, exploded view of two sub-components of the ball illustrated in Fig. 1;

Figure 4 is an isometric view of the two sub-components illustrated in Fig. 3 viewed as assembled;

Figure 5 is an isometric view of a ball according to another embodiment of the invention, wherein the backside, bottom left of the ball is a substantial mirror image of the front side, top right.

Detailed Description

Figure 1 is an isometric view of a toy ball apparatus 10 according to an embodiment of the invention. Ball 10 may include a surface that is formed by a mesh 12. Mesh 12 may be formed from a plurality of differently sized loop structures 14 and 16. For this embodiment, loop structures 14 may be relatively smaller than loop structures 16. Loop structures 14 and 16 may be appropriately sized to receive the fingers of a user's hand, such as a child's hand. Loop structures 14 and 16 typically may be continuously curved on their inside surface (14a and 16a, respectively) and, therefore,

contain no angular portions that may be uncomfortable when ball 10 is grasped and/or thrown by a user.

A plurality of loop structures 14 and 16 also may be included in loop structure assemblies 18 and 20. For this embodiment, loop structure assembly 18 may be termed a "four-loop assembly", while loop structure assembly 20 may be termed a "three-loop assembly." In this respect, loop structure assembly 18 may include two smaller loop structures 14 and two larger loop structures 16, while loop structure assembly 20 may include one smaller loop structure 14 and two larger loop structures 16. It will be appreciated that any subset of loop structures 14 and 16 of ball 10 may be included in loop structure assemblies, such as loop structure assemblies 18 and 20.

Ball 10, as shown in Figure 1 and previously indicated, may be formed using loop structures 14 and 16 (hereafter "structures") and/or loop structure assemblies 18 and 20 (hereafter "assemblies"). It will be appreciated that the use of loop structure assemblies may reduce the number of component parts for ball 10. Such a reduction in component parts may reduce manufacturing complexity and, as a result, reduce manufacturing costs. In forming ball 10, each component part may be affixed to one or more adjacent component parts using an adhesive, or any number of appropriate fastening techniques. Seams 22, also referred to as joints 22, may be formed between adjacent component parts when they are affixed to each other. The structure of mesh 12 may help distribute stress over ball 10 when it is stretched or deformed, thereby reducing stress on seams 22 and loop structures 14, 16. This is because the loop structures, and the absence of any angular holes or sharp corners, may allow such stresses to be distributed over the surface

of ball 10, improving its overall strength and in particular, reducing the possibility of tearing.

Within assemblies 18 and 20, as well as at intersections of seams 22, ball 10 may include web structures 24 that are interstitially located between structures 14 and 16, and assemblies 18 and 20 of ball 10. Web structures 24 may further improve the strength, durability and resiliency of ball 10, as they may, in conjunction with mesh 12, distribute stress over the surface of ball 10 when it is stretched or deformed. Additionally, within assemblies 18 and 20, structures 14 and 16 may form substantially circular finger-receiving open spaces 28, which may be used to grip, stretch, throw and/or catch ball 10.

Structures 14 and 16, and assemblies 18 and 20 may be formed from a variety of materials, such as various plastic or polymer materials. For example, structures 14 and 16, and assemblies 18 and 20 may be formed of thermoplastic using an injection molding process. Structures 14 and 16 and/or assemblies 18 and 20, once molded, may be assembled to form ball 10, as shown in Fig. 1. Also, because structures 14 and 16 and assemblies 18 and 20 may be individually molded, each component part of ball 10 may be of a different color material, if desired, which may improve the aesthetic appearance of ball 10. Because there is substantially more open space than structure in ball 10 and because it has a high strength-to-weight ratio, especially in tension, only a small amount of material need be used in order to define a ball-like shape, which decreases the cost of manufacture.

Ball 10 (e.g. structures 14 and 16, and/or assemblies 18 and 20) may be formed of materials that result in ball 10 being substantially deformable, as well as substantially

resilient or rigid. In this respect, ball 10 may be formed of plastic or polymer materials having a shore "A" hardness of between approximately 50 and 150. As a result, ball 10 may be at least partially deformed into a space 26, also referred to as closed volume 26, surrounded by mesh 12. Typically, once a force, or object, causing such deformation is removed from ball 10, the resilient character of mesh 12 results in ball 10 substantially returning to its original shape. Due to mesh 12 being substantially deformable and substantially resilient, ball 10 may bounce when thrown against an object or impediment. Such deformability and resiliency of ball 10 may also make it more comfortable to catch and throw as compared to prior devices. The resiliency of ball 10 may be varied by using materials of different shore hardness, as was previously noted. Such variations may provide for manufacturing a competition-type sports ball, such as a soccer ball, that would not require inflation, as well as a highly deformable and resilient structure. A first portion of the mesh may be formed of a first hardness and a second portion of the mesh may be formed with a second hardness. The mesh may be used to form, for example, a dual stiffness toy apparatus such as a baseball bat with a handle that is stiffer than the head of the bat.

Ball 10 may form a polyhedron shape such as a truncated icosahedron (an approximate soccer ball shape, as shown in Figure 1). Further, ball 10 may approximate a sphere in cross-section, or on an axis of rotation. It will be appreciated that other polyhedron shapes may be formed, such as tetrahedrons, icosahedrons, icosadodecahedron or dodecahedrons. Alternatively, other non-polyhedron shapes may be formed using structures 14 and 16, and/or assemblies 18 and 20, such as ovoids,

animal shapes, baseball bats, sports racquets, organic shapes, and/or basketball nets, among many other possible configurations.

Referring to Figure 2, an exploded view of an approximate hemisphere of ball 10 is indicated generally at 30. Hemisphere 30 may include one four-loop structure assembly 18 and four two-loop structure assemblies 20, which may include cooperative mating surfaces 32. Mating surfaces 32 may be arranged around the perimeter of assemblies 18 and 20. Mating surfaces 32 also may be congruent and substantially planar. Alternatively, mating surfaces 32 may be complimentarily convex and concave in configuration, or any number of other complimentary surface configurations.

However, it may be desirable that assemblies 18 and 20 be of a configuration that is relatively easy to tool for molding, such as injection molding. In this regard, it may be desirable to reduce the number of undercuts, as well as limit the curvature in such molds. Such measures may reduce the likelihood that assemblies 18 and 20 become damaged when ejected from their molds without significantly increasing tooling cost for such molds, such as associated with sliding portions of such molds.

A single assembly 18, and four assemblies 20 may be affixed together along mating surfaces 32, as indicated in Fig. 2, to form approximate hemisphere 30 of ball 10. Two hemispheres 30 may then be affixed along mating surfaces 32 to form ball 10. In this regard, ball 10 may include two assemblies 18 (which may be termed "ends") and eight assemblies 20 (which may be termed "sides"). Alternatively, as illustrated in Figure 5, twelve loop structures 14 and twenty loop structures 16 may be used to form ball 10', with each loop structure 14 and 16 including mating surfaces 32 around its

perimeter. However, as was indicated earlier, it may be desirable to reduce the number of individual components included in ball 10, so as to reduce manufacturing complexity.

Loop structures 14 may include mating surfaces 32 that are pentagonal in arrangement, while loop structures 16 may include mating surfaces 32 that are hexagonal in arrangement (such as shown in Figure 2). It will be appreciated that many other configurations are possible. For example, structures 14 may include mating surfaces that are square in arrangement and loop structures 16 may include mating surfaces that are octagonal in arrangement, or any other compatible polygonal arrangements may be used. In such a configuration, structures 14 and 16 may still include continuously curved inner surfaces 14a and 16a that include no angular portions so as to be comfortable for gripping, catching and/or throwing, as well as better distributing forces and stress over the surface of ball 10.

Referring to Figures 3 and 4, a more detailed view of the assembly of assembly 18 with assembly 20 is shown. In Figure 3, arrows indicate how assembly 18 and assembly 20 may be mated at cooperative mating surfaces 32 when forming mesh 12 of ball 10. Interstitial web structures 24 are formed within assemblies 18 and 20. Referring to Figure 4, assembly 18 and assembly 20 are affixed with each other at mating surfaces 32. Seams 22 are formed between assembly 18 and assembly 20 (along mating surfaces 32). At the intersection of seams 22, additional web structures 24 are formed as a result of affixing assembly 18 with assembly 20.

While ball 10 has been described above, an alternative way of describing ball 10, with reference to Figures 1 and 2, is as follows. Ball 10 may include an elastic mesh

structure 12 formed from plural elongate strands 14 and 16. Mesh structure 12 may also include joinder regions 32 uniting adjacent strands 14 and 16 to form, as viewed in developed form, plural closed-perimeter open spaces 28 including such spaces 28 which are defined, substantially completely throughout their perimeters, by curved perimeter surfaces 14 and 16, or endless-loop curved surfaces. The curved perimeter surfaces 14 and 16 may be, with elastic deformation of the mesh 12, permitted to flex so as selectively, and depending upon the character of deformation, to increase or decrease with regard to local radius of curvature. Further, mesh 12 may be characterized as having substantial radial symmetry within its pattern. Each closed-perimeter open space 28 and joinder region 32 typically includes a central zone, and each is characterized, relative to its central zone, by substantial radial symmetry within the pattern.

The invention may also be described as a toy apparatus 10, including a plurality of substantially deformable smooth loops 14, 16, one or more of the loops being closed, and a plurality of mating surfaces 32 disposed perimetrically around at least a portion of each loop, for coupling the loops with one another, wherein the plurality of loops 14, 16, when coupled, form a resilient mesh 12, which defines a surface. The loops may be differently sized so as to provide for curving the surface, to form a spherical ball, or a polyhedron such as a truncated icosahedron, tetrahedron, icosahedron, icosadodecahedron or dodecahedron.

Although the invention has been disclosed in its preferred forms, the specific embodiments thereof as disclosed and illustrated herein are not to be considered in a limiting sense, because numerous variations are possible. The subject matter of the

invention includes all novel and non-obvious combinations and sub-combinations of the various elements, features, functions, and/or properties disclosed herein. The following claims define certain combinations and sub-combinations of features, functions, elements, and/or properties that are regarded as novel and non-obvious. Other combinations and sub-combinations may be claimed through amendment of the present claims or presentation of new claims in this or a related application. Such claims, whether they are broader, narrower, equal, or different in scope to any earlier claims, also are regarded as included within the subject matter of the invention.